

# PATENT ABSTRACTS OF JAPAN

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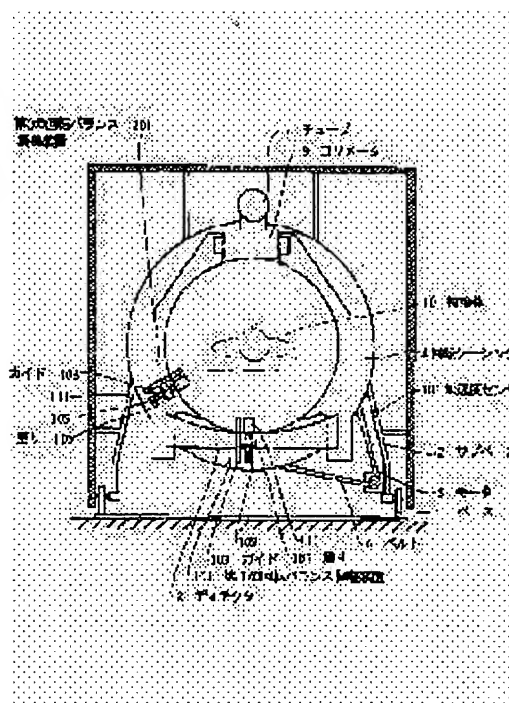
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## (54) GANTRY ROTATION BALANCE ADJUSTING INSTRUMENT

### (57)Abstract:

PROBLEM TO BE SOLVED: To provide a highly precise gantry rotation balance adjusting instrument.

SOLUTION: This instrument is comprised of a guide 103 mounted at least either in the radial direction or in the rotation axis direction of a rotary casing (gantry rotating part) 4, and a weight 105 mounted movably on the guide 103.



## LEGAL STATUS

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CLAIMS

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[Claim(s)]

[Claim 1] The rotation balance adjusting device of the gantry characterized by having the guide prepared in at least one direction among radial [ of the gantry rotation section ], and the direction of the axis of rotation, and the weight formed possible [ movement to this guide ].

[Claim 2] The rotation balance adjusting device of the gantry according to claim 1 carry out having had the driving means which drive the aforementioned weight along with the aforementioned guide, an oscillating detection means detect vibration of the aforementioned gantry rotation section, and the control means drive the aforementioned driving means so that vibration of the aforementioned gantry rotation section may become small in response to the signal from the aforementioned oscillating detection means, rotating the aforementioned gantry rotation section as the feature.

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## DETAILED DESCRIPTION

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### [Detailed Description of the Invention]

[0001]

[The technical field to which invention belongs] this invention relates to the equipment which performs rotation balance (balance) adjustment of the gantry (gantry) rotation section of radiation CT (Computed Tomography) equipment.

[0002]

[Description of the Prior Art] In radiation CT equipment, when imbalance (unbalance) was in the gantry rotation section and the gantry rotation section rotates, vibration occurs and it has big influence on quality of image.

[0003] Therefore, the time of gantry manufacture, and when the parts (for example, a tube (tube) and a detector (detector)) of gantry rotation circles are exchanged, rotation balance adjustment of the gantry rotation section is performed.

[0004] On the other hand, high-speed rotation of the gantry rotation section is carried out, and it is requested that inspection time is shortened. The centrifugal force which acts on the gantry rotation section is proportional to the square of the rotational speed (angular velocity) of the gantry rotation section.

[0005] For example, if rotational speed of the gantry rotation section is made into twice now, in order for a centrifugal force to increase 4 times and to suppress vibration to the present grade, it becomes whether the imbalanced amount of the gantry rotation section is set to one fourth of now, or to increase the rigidity of a gantry 4 times of now.

[0006] If the rigidity of a gantry is raised, since equipment will be enlarged and cost (cost) will also go up, it is desirable to lessen the imbalanced amount of the gantry rotation section. The following methods are used as a method of measuring the rotation balance of the gantry rotation section.

[0007] (1) Measure the starting torque of the clockwise rotation of the gantry rotation section, and a counterclockwise rotation with the spring balance etc., and measure the imbalance of the gantry rotation section from the difference of the starting torque of two directions.

[0008] (2) Prepare oscillating detection meanses, such as an acceleration sensor, in portions other than the gantry rotation section, for example, a frame, (frame), and measure imbalance from vibration of the gantry rotation section.

(3) Arrange a pin (pin) in the scanning center (scan center) of a gantry, rotate the gantry rotation section, and measure the imbalance of the gantry rotation section from the shadow of the pin detected by the detector.

[0009] And according to the imbalanced amount of the gantry rotation section measured by one method of above-mentioned (1) - (3), weight is attached in the gantry rotation section, or the weight attached in the gantry rotation section is removed, and rotation balance of the gantry rotation section is adjusted.

[0010]

[Problem(s) to be Solved by the Invention] However, by the rotation balance adjustment method of the gantry rotation section of the above-mentioned composition, the precision of balance adjustment does

not become below the minimum weight (for example, 0.5kg) of weight, but there is a trouble of being inaccurate.

[0011] this invention was made in view of the above-mentioned trouble, and the purpose is in offering the rotation balance adjusting device of an accurate gantry.

[0012]

[Means for Solving the Problem] this invention which solves the above-mentioned technical problem is the rotation balance adjusting device of the gantry characterized by having the guide prepared in at least one direction among radial [ of the gantry rotation section ], and the direction of the axis of rotation, and the weight formed possible [ movement to this guide ].

[0013] When a guide is prepared in radial [ of the gantry rotation section ], radial rotation balance adjustment of the gantry rotation section is made by moving weight along with a guide.

[0014] When a guide is prepared in the direction of the axis of rotation of the gantry rotation section, rotation balance adjustment of the direction of the axis of rotation of the gantry rotation section is made by moving weight along with a guide.

[0015] Since weight moves along with a guide, the position of weight can be changed continuously and the precision of balance adjustment becomes good. Since rotation balance can be maintained with a sufficient precision, generating of vibration decreases.

[0016] For this reason, without enlarging equipment and cost also raising the rigidity of this gantry, the gantry rotation section can be rotated at high speed, and inspection time can be shortened. Invention according to claim 2 is the rotation balance adjusting device of the gantry carry out having had the driving means which drive the aforementioned weight of invention according to claim 1 along with the aforementioned guide, an oscillating detection means detect vibration of the aforementioned gantry rotation section, and the control means drive the aforementioned driving means so that vibration of the aforementioned gantry rotation section may become small in response to the signal from the aforementioned oscillating detection means, rotating the aforementioned gantry rotation section as the feature.

[0017] Rotating the gantry rotation section, control means receive the signal of vibration of the gantry rotation section from an oscillating detection means, and they change weight continuously along with a guide through driving means so that vibration of the gantry rotation section may become small.

[0018] Accurate rotation balance adjustment can be performed by carrying out direct detection of the vibration of the gantry rotation section using an oscillating detection means. More accurate rotation balance adjustment can be performed by rotating the gantry rotation section at high speed, and making the gantry rotation section generate a big vibration.

[0019] In addition, as an oscillating detection means, although there are an acceleration sensor (sensor), a displacement sensor, a distortion sensor, etc., it does not limit. Moreover, a pin may be arranged in the scanning center of a gantry, the gantry rotation section may be rotated, and vibration may be detected from the shadow of the pin detected by the detector.

[0020] Furthermore, an oscillating detection means may be beforehand attached in a gantry, and post-installation is sufficient as it. Moreover, when the gantry rotation section carries out high-speed rotation, in order to prevent that weight moves along with a guide with a centrifugal force, it is also desirable to establish a lock means to forbid weight from moving along with a guide.

[0021]

[Embodiments of the Invention] Next, the example of a form of operation of this invention is explained using a drawing. First, a gantry is explained using drawing 1 and drawing 2.

[0022] In drawing 2, 1 is the base placed on a floor. 2 is the subbase prepared in the cross direction possible [ an inclination ] to the base 1. Fixed casing by which 3 was prepared in the subbase 2, and 4 are rotation casing as the gantry rotation section prepared possible [ rotation ] to the fixed casing 3.

[0023] In drawing 1, 5 is a motor which is formed in a subbase 2 and carries out the rotation drive of the rotation casing 4 through a belt 6. The tube 7 which is the radiation source which emits radiation to the analyte 10 laid in the rotation casing 4, and the detector 8 which detects the radiation which penetrated the analyte 10 are formed in the rotation casing 4. Moreover, 9 is a collimator which is

formed near the tube 7 and prepares the radiation direction of the radiation of a tube 7.

[0024] When the rotation casing 4 rotates by the motor 5, a tube 7 and a detector 8 rotate the circumference of an analyte 10, and the transparency radiation which penetrated the analyte 10 is detected by the detector 8. Detection of such transparency radiation is called a scan (scan), and the tomogram for an analyte 10 is reconfigured based on two or more views obtained by this scan.

[0025] The 1st which adjusts the radial balance of the rotation casing 4, and 2nd rotation balance adjusting devices 101,201 are formed in the rotation casing 4. Next, the 1st and 2nd rotation balance adjusting devices 201,301 are explained using drawing 3. In addition, since the 1st and 2nd rotation balance adjusting devices 101,201 are the same structure, it explains using the 1st rotation balance adjusting device 101, and explanation of the 2nd rotation balance adjusting device 201 is omitted.

[0026] Weight 105 is engaging with the guide 103 prepared in radial [ of the rotation casing 4 ] possible [ movement ]. The female screw hole 107 is formed in weight 105, it is installed in this female screw hole 107 side by side with a guide 103, and seed \*\*\*\* 109 supported possible [ rotation ] is screwing in it.

[0027] One edge of the screw-thread rod 109 is connected to the output shaft of a brake motor 111. A brake motor 111 has electromagnetic brake inside, when driving a motor, a brake is taken off, and when a motor is a idle state, a brake acts.

[0028] Moreover, as shown in drawing 1, the acceleration sensor 301 as an oscillating detection means which detects vibration of the direction of a rotation flat surface of the rotation casing 4 is formed in the subbase 2 which supports the rotation casing 4.

[0029] Next, the electric composition of the example of a gestalt of this operation is explained using drawing 4. 401 is control means which control the motor 5 which receives the signal of an acceleration sensor 301 and carries out the rotation drive of the rotation casing 4 according to the program (procedure) 403 recorded on auxiliary memory, such as IC memories, such as ROM, and a floppy disk, a hard disk, etc., and the brake motor 111 of the 1st and 2nd rotation balance adjusting devices 101,201.

[0030] Control means 401, a program 403, and an acceleration sensor 301 may be the gestalten which can be connected to radiation CT equipment, when you may include in the radiation CT equipment with which a rotation balance adjusting device is formed beforehand and a serviceman etc. performs rotation balance adjustment.

[0031] Operation of the above-mentioned composition is explained.

(1) Control means 401 drive a motor 5 and rotate the rotation casing 4 with low rotational speed.

[0032] (2) Control means 401 receive the signal from an acceleration sensor 301, drive the brake motor 111 of the 1st and 2nd rotation balance adjusting devices, and move weight 105 along with a guide 103 to the position where the signal of an acceleration sensor 301 serves as the minimum.

[0033] (3) Control means 401 rotate the rotation casing 4 previously more quickly. (1) - (3) is repeated and it carries out to the rotational speed of the quickest rotation casing 4. According to the above-mentioned composition, radial rotation balance adjustment of the rotation casing 4 can be performed.

[0034] And since the weight 105 of the 1st and 2nd rotation balance adjusting devices 101,201 moves along with a guide 103, the position of weight 105 can be changed continuously and the precision of balance adjustment becomes good.

[0035] Since rotation balance can be maintained with a sufficient precision, generating of vibration decreases. For this reason, without enlarging equipment and cost also raising the rigidity of this gantry, the rotation casing (gantry rotation section) 4 can be rotated at high speed, and inspection time can be shortened.

[0036] Accurate rotation balance adjustment can be performed using an acceleration sensor 301 by carrying out direct detection of the vibration of the rotation casing 4 which is the gantry rotation section.

[0037] More accurate rotation balance adjustment can be performed by rotating the rotation casing 4 at high speed, and making the rotation casing 4 generate a big vibration. Moreover, in the example of a gestalt of this operation, it can prevent that weight 105 moves along with a guide 103 by having used the brake motor 111 with a centrifugal force.

[0038] In addition, this invention is not limited to the example of a gestalt of the above-mentioned implementation. In the example of a gestalt of the above-mentioned implementation, an acceleration sensor 301 is used as an oscillating detection means -- otherwise, you may be a displacement sensor, a distortion sensor, etc.

[0039] Moreover, a pin may be arranged in the scanning center of a gantry, the rotation casing 4 may be rotated, and vibration may be detected from the shadow of the pin detected by the detector 8. Furthermore, an oscillating detection means may be beforehand attached in a gantry, and post-installation is sufficient as it.

[0040] Moreover, although the brake motor 111 was used in the 1st in the example of a gestalt of the above-mentioned implementation, and 2nd rotation balance adjusting devices [ 2nd ] 101,201, it is possible even if it uses the usual motor. In this case, what is necessary is just to establish separately the lock mechanism in which weight 105 is forbidden from moving along with a guide 103.

[0041] Furthermore, although the composition which weight 105 moves along with a guide 103 explained in the 1st of the example of a gestalt of the above-mentioned implementation, and 2nd rotation balance adjusting devices 101,201, in drawing 3, the brake motor 111 which serves as weight by fixing the member equivalent to weight 105 to the rotation casing 4, and rotating a brake motor 111, and composition for which a guide 103 is moved to radial [ of the rotation casing 4 ] may be used.

[0042] Moreover, what is necessary is just to prepare the 3rd [ move / weight 105 / in the direction of the axis of rotation of the rotation casing 4 ] rotation balance adjusting device 501 by the same composition as the 1st and 2nd rotation balance adjusting devices 101,201, as shown in drawing 5, in order to adjust the rotation balance of the direction of the axis of rotation of the rotation casing 4, although the 1st which adjusts the radial rotation balance of the rotation casing 4, and 2nd rotation balance adjusting devices 101,201 were formed in the example of a gestalt

[0043] And when adjusting the rotation balance of the direction of the axis of rotation of the rotation casing 4, a control section 401 performs the following operation.

(1) Control means 401 drive a motor 5 and rotate the rotation casing 4 with low rotational speed.

[0044] (2) Control means 401 receive the signal from an acceleration sensor 301, drive the brake motor 111 of the 3rd rotation balance adjusting device 501, and move weight 105 to the position where the signal of an acceleration sensor 301 serves as the minimum along with the guide 103 which met in the direction of the axis of rotation of the rotation casing 4.

[0045] (3) Control means 401 rotate the rotation casing 4 previously more quickly. (1) - (3) is repeated and it carries out to the rotational speed of the quickest rotation casing 4. According to such composition, rotation balance adjustment of the direction of the axis of rotation of the rotation casing 4 can be performed.

[0046] And since the weight 105 of the 3rd rotation balance adjusting device 501 moves along with a guide 103, the position of weight 105 can be changed continuously and the precision of balance adjustment becomes good.

[0047] Since rotation balance can be maintained with a sufficient precision, generating of vibration decreases. For this reason, without enlarging equipment and cost also raising the rigidity of this gantry, the rotation casing (gantry rotation section) 4 can be rotated at high speed, and inspection time can be shortened.

[0048] Accurate rotation balance adjustment can be performed using an acceleration sensor 301 by carrying out direct detection of the vibration of the rotation casing 4 which is the gantry rotation section.

[0049] More accurate rotation balance adjustment can be performed by rotating the rotation casing 4 at high speed, and making the rotation casing 4 generate a big vibration. And in order to adjust the radial rotation balance of the rotation casing 4, the 1st and 2nd rotation balance adjusting devices 101,201 are formed, and further, in order to adjust the rotation balance of the direction of the axis of rotation of the rotation casing 4, you may form the 3rd rotation balance adjusting device 501.

[0050] In this case, radial rotation balance adjustment of the rotation casing 4 and rotation balance adjustment of the direction of the axis of rotation of the rotation casing 4 can be performed with a

sufficient precision.

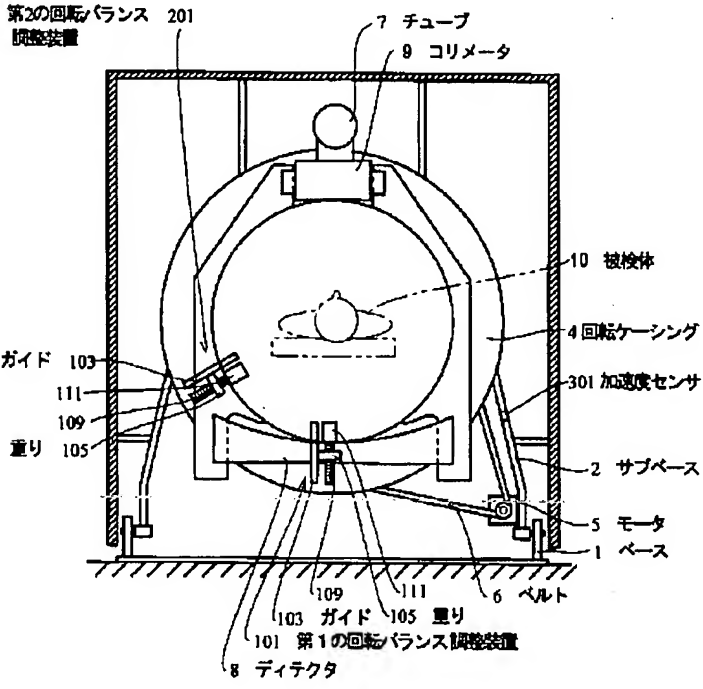
[0051]

[Effect of the Invention] As stated above, according to this invention, the rotation balance adjusting device of an accurate gantry is realizable.

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Drawing selection drawing 1



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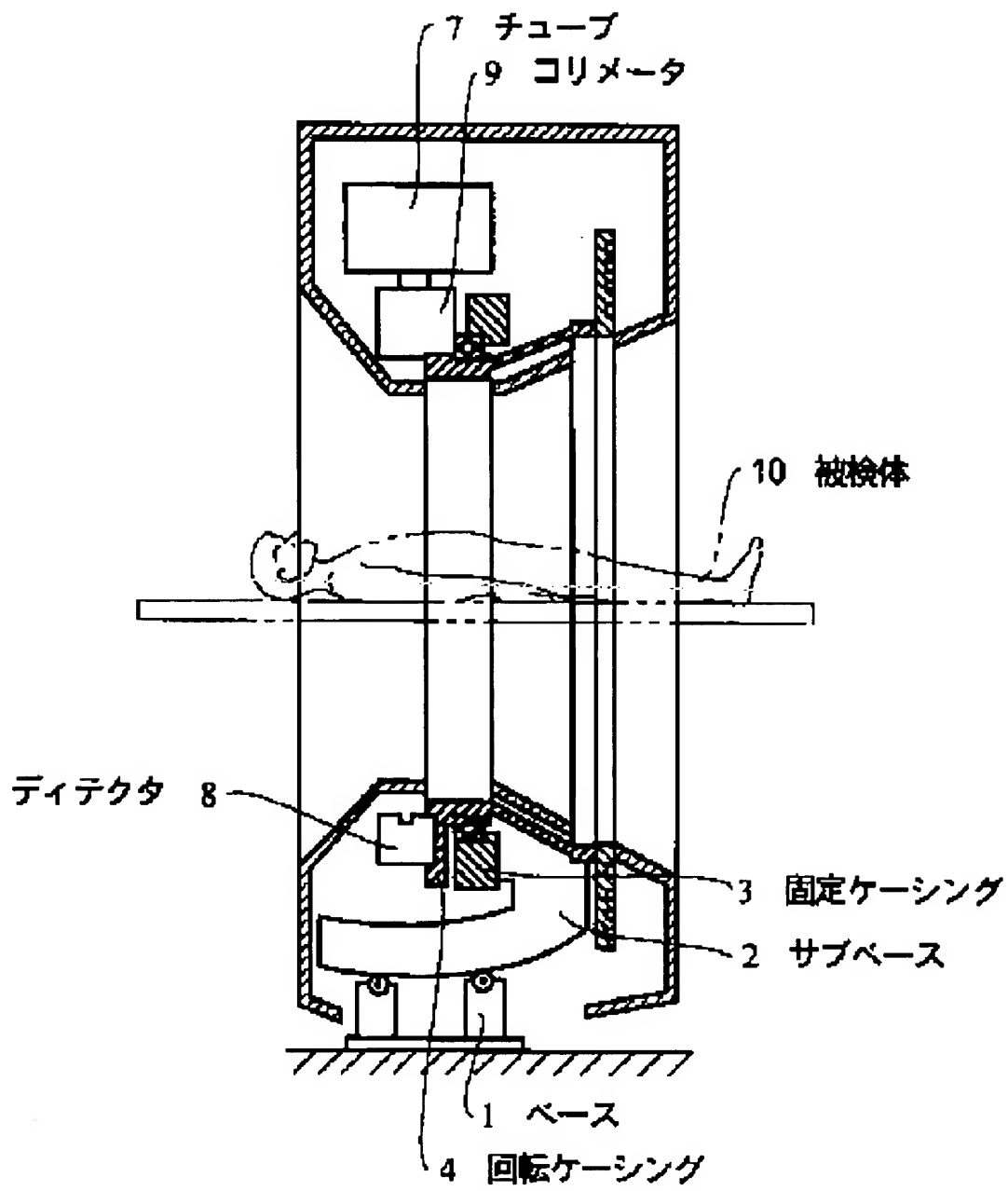
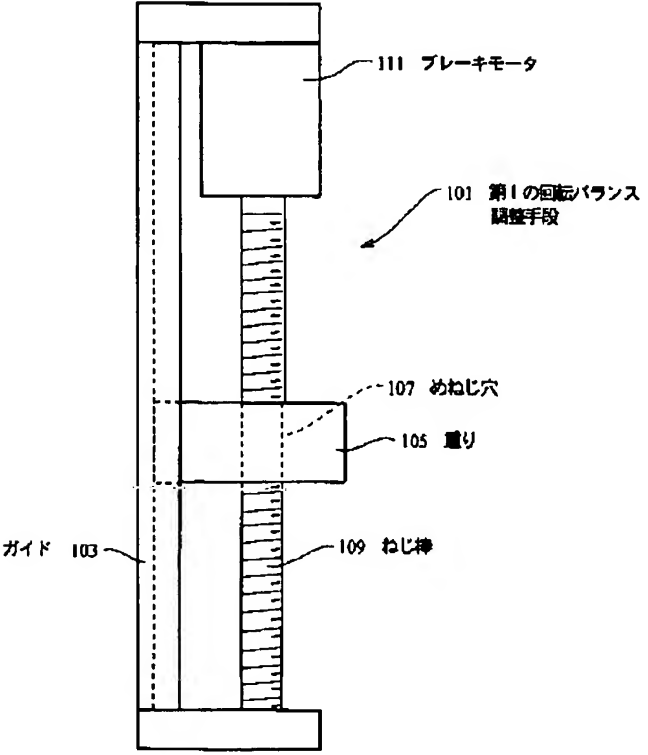


Fig-2

Drawing selection drawing 3

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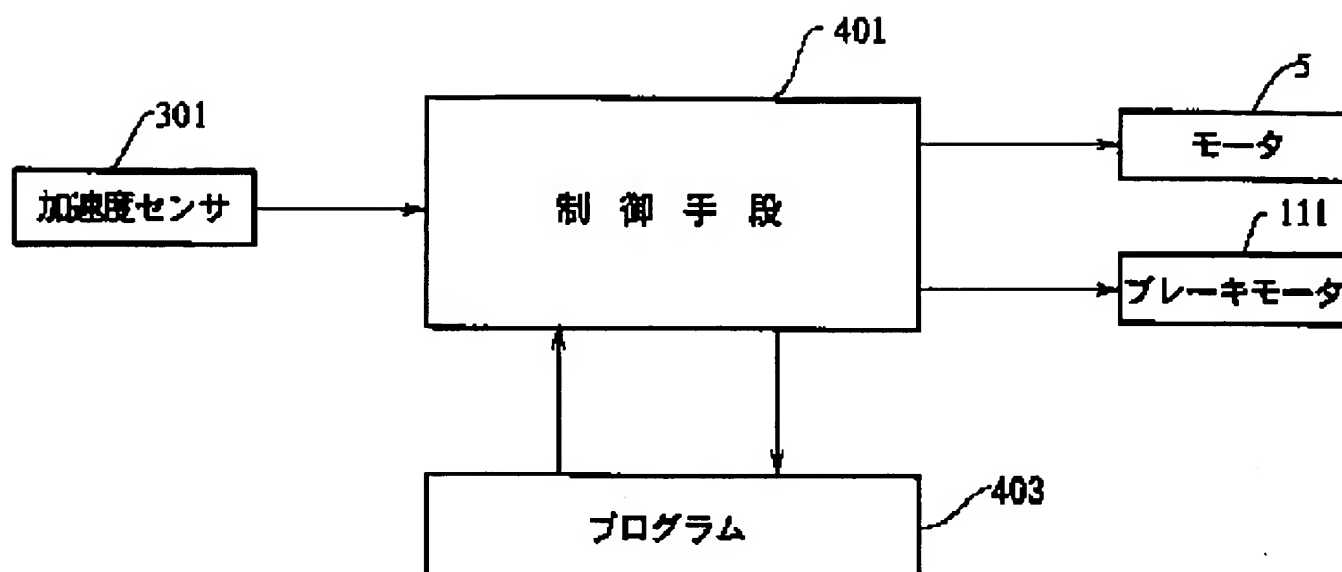


Fig. 4

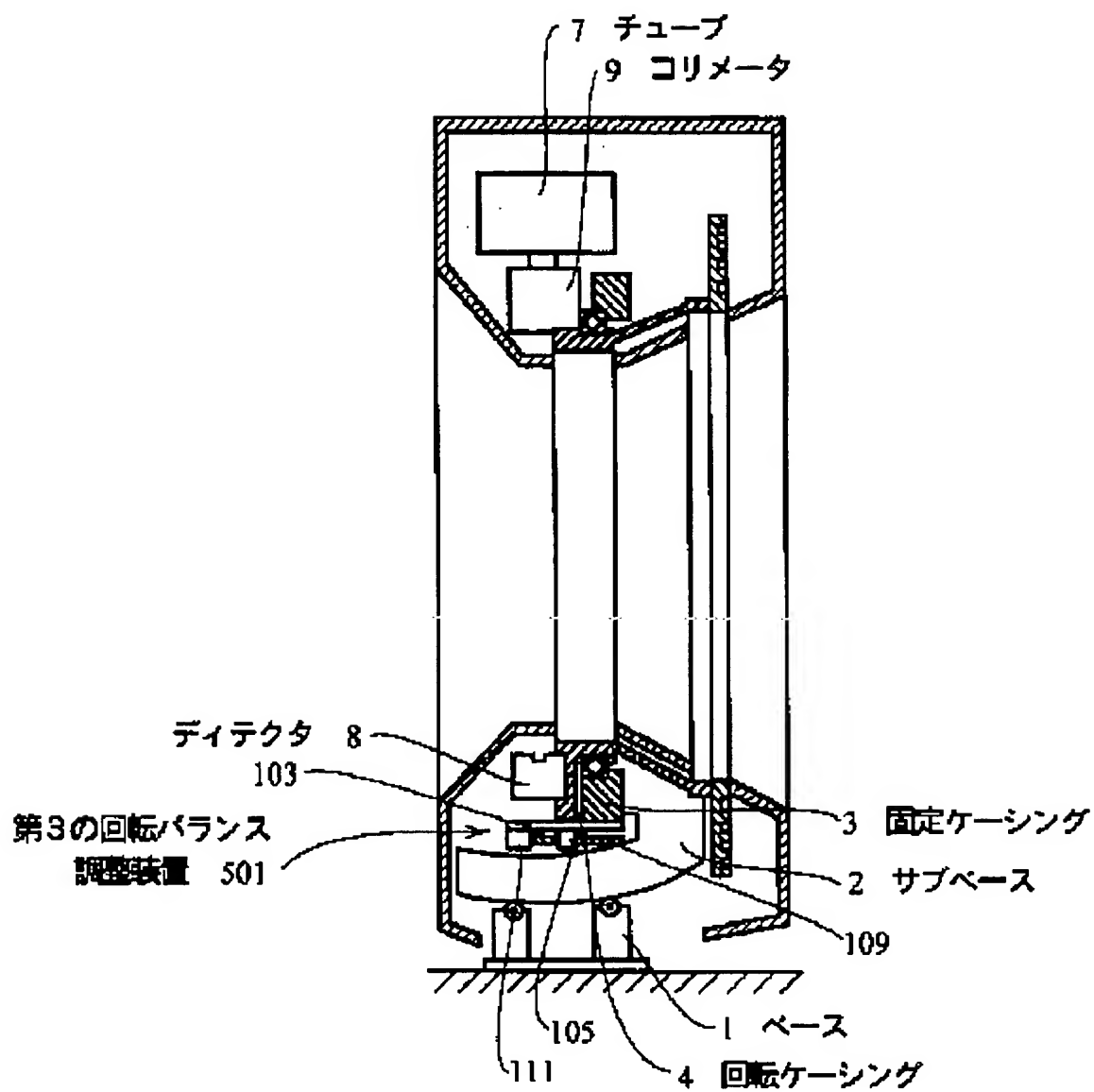


Fig. 5